63 *may* have been originally drawn by M. Bertrand; but, as no reference is given, we cannot meantime be sure whether his claim is any better than that of Clausius.

Detailed analysis being clearly out of place here, we conclude with a few running comments on the different parts of the work. The first part deals with Electrostatical Phenomena. Except that we think the introductory chapter somewhat hurried and meagre, we commend the general simplicity of the arrangement. A quasi-physical proof of most of the general propositions concerning electrified systems is given, and, we think, in the interest of the physical reader, that this is right. The seventh chapter of this part is especially recommended to the notice of our readers; there, so far as we know for the first time, Sir W. Thomson's theory of dielectrics finds its place in a text-book on Electrostatics; both here and in the corresponding chapters on Magnetism the authors show a complete appreciation and mastery of this important step in mathematical physics. Until Maxwell's treatise was written, this piece of Thomson's work had been apparently forgotten. It has lately been taken up in Germany, more especially by Helmholtz *more suo*. This neglect is no doubt to be explained by the equal neglect of the ideas of Faraday, of which Thomson's theory is the mathematical embodiment. The errors one occasionally finds on this subject in continental text-books of authority are very surprising, *e.g.* it will be found stated that a small sphere of magnetic or diamagnetic substance tends to move *along the lines of force*; the better diffusion of the true theory will surely tend to prevent such fundamental mistakes as this. The application of Thomson's theory to dielectrics is most interesting and important theoretically; but great difficulty has been found in verifying it experimentally, owing to the scarcity of bodies that will insulate sufficiently well. Its application to magnetics has been most successful, as our readers doubtless know.

The second part treats of electric currents, stationary and variable, and will probably be found well suited for the higher class of practical electricians; the account of the theory of telegraphic signalling deserves special mention. In Chapter II. of this part the authors are more cautious as to Volta's law of contact than they are at the end of the former part, knowing doubtless, as sound practicians, that they are on delicate ground.

The theory of magnetism, which constitutes the third part, suffers, as did the electrostatics, in the beginning, from the suppression of experimental detail. We cannot reconcile ourselves to the definition given of the magnetic axis as the line joining the poles of the magnet. This seems a very artificial and difficult way of introducing this fundamental conception; and we do not see the advantage over the ordinary method, which defines it as that direction which is always found parallel to a certain fixed vertical plane when the magnet is suspended freely under the earth's action alone at a given time and place. We also fail to see why, in mentioning the hypotheses advanced to explain terrestrial magnetism, Gilbert and Biot should be mentioned, and Halley and Hansteen forgotten. In other respects, this part of the work gives as good an account of its subject as most treatises we have seen. Our readers may note the discussion of the direct magnetic action of the heavenly bodies as something fresh in a text-book.

The last part of the work deals with Electro-magnetism. The connection between a current and the equivalent magnetic shell is deduced in a very ingenious (although we scarcely think simple) way from the law of Biot and Savart. The other method, which we prefer, is also given, in which the elementary proposition is that a plane circuit, whose linear dimensions are infinitely small compared with the distance of the point at which its action is considered may be replaced by a small magnet. A separate chapter is very properly given to the Methods of Ampère, and the authors have shown their judgment in refraining from loading their pages with the various solutions of the indeterminate problem to find the elementary law of electrodynamic action of which we have lately had a superfluity. An excellent account is given of the general theory of Maxwell. The only thing we would take objection to is yet another meaning given to that overburdened word Electromotive Force; the authors use *Force Electromotrice Totale* in place of Maxwell's *Vector Potential*. The deduction of the rotation of the plane of polarisation from Hall's phenomenon is given; but Prof. Rowland's name is not mentioned in connection with it; although we are under the impression that it was first given by him in the *American Journal of Mathematics*.

In a supplementary chapter some examples are given of the application to electrical phenomena of the principles of Carnot. Certain of these, due to M. Lippmann, are ranged under the somewhat high-sounding title of the Conservation of Electricity. We are a little inclined to question the propriety of this phrase; but we are certainly obliged to MM. Mascart and Joubert for a succinct account of what we are to understand by it.

We shall look with much interest for the second volume of this work, in which, among other things of interest to practical electricians, we are promised a discussion of the efficiency of electric generators and electromotors, a subject on which the recent experience of the authors at the Paris Exhibition must have well qualified them to give an opinion. G. C.

OUR BOOK SHELF

Die Gasteropoden der Meeres-ablagerungen der ersten und zweiten miocänen mediterran-stufe in der Oesterreichisch—Ungarischen Monarchie. Von R. Hörnes und M. Auinger. Lieferung 1, 2, 3. (Vienna: Hölder, 1879-1882.)

A MERITORIOUS and useful contribution to our knowledge of the tertiaries of middle Europe. The first-named author is the worthy son of a worthy sire, the late Prof. Hörnes, whose work on the fossil shells of the Vienna Basin is so familiar to palæontologists. The total number of species hitherto described or noticed in the present publication is 220, including 94 new species or forms. Out of all this number 11 only are given as recent or living; and two more may be added (viz. *Nassa semistriata* and *Columbella corrugata* of Brocchi), which inhabit the Mediterranean as well as the North Atlantic. These recent species have survived from the Miocene epoch—a period of incalculably remote antiquity—without the slightest change. The rest may be regarded as the οἱ πλέονες in the same sense as we use euphemistically for our dead. Perhaps some more fossil species may be hereafter iden-

tified with living species when palæontologists work in unison with naturalists, or when conchologists become acquainted with both kinds of species. This is a great desideratum; and for want of it several eminent palæontologists (Nyst, Hörnes, and others) made regrettable mistakes in such identification, having been misled by names and not things. We may observe that Gastropoden, instead of Gasteropoden, is the more correct and usual spelling of the word. The plates, sixteen altogether, are admirably executed; and the publication does great credit to the Imperial Institute of Geology at Vienna.

J. GWYN JEFFREYS

LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.*

[*The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to ensure the appearance even of communications containing interesting and novel facts.*]

The Winter of 1881-82

YOU have given some figures about the winter of 1881-82 in Great Britain. It was relatively much warmer here. The mean temperatures and its variation from average for November, 1881, to April, 1882, was:

	Nov.	Dec.	Jan.	Feb.	March.	April.
Mean	32·0	23·2	29·5	25·0	31·5	38·2
Diff. from average	+2·7	+3·1	+14·5	+8·4	+8·0	+3·1

The general character of these months is thus a very decided high temperature. That of January was the warmest on record in the 130 years' observation. If we take the mean of the three months, January, February, and March, it is also the highest on record, viz., 28·7; the other years in which these three months had the highest temperature were: 1822, 28.1; 1863, 27·4; 1843, 26·9; 1794, 26·6. The temperature of the five months, November to March, viz., 28·2 in 1881-82, was surpassed only once, in 1821-22, 29·3; the other years when these months were warmest are: 1842-43, 27·6; 1761-69, 27·1; and 1826-27, 26·9.

The Neva was frozen less than four months, while on the average the ice lasts nearly five months (147 days), and in the winter of 1880-81 the river was frozen 184 days, the longest time on record since the observations began, that is, for about 175 years. The date of opening of the river this year, March 30, is the earliest, except that of 1822 (March 18).

The last winter is, besides, noticeable for its deficiency of snow, there being scarcely ten days of fair sleighing. The precipitation of the months from November to March was 1″·9 less than the average, that of December alone by 0″·8, that is, by nearly two-thirds. Besides, a large part of it fell as rain. On account of the want of snow, the rivers had not their ordinary spring floods, and great quantities of timber, prepared to be floated for the use of St. Petersburg, could not be moved.

On the middle and lower Wolga, the snowfall of last winter was excessive, and even Taschkent and the valley of Ferghana, in Central Asia (lat. 40°–42°), had an exceedingly cold winter, with permanent and deep snow. The winter was also very cold in Transcaucasia, the minimum temperature in November, 1881, being lower than ever observed before in Tiflis.

St. Petersburg, May 27 A. WOEIKOF

The Mean Temperature of the Atmosphere at the Surface of the Earth as Determined by Observations and by Theory

WHEN several people, not knowing each other, arrive at the same results, the one by compilation and computation of observations, the others by theory, these results present a good probability of correctness, and the theory involved ought to be of interest to science.

In NATURE, vol. xxv. p. 395, I read—"The temperature of the southern hemisphere has lately been investigated by Dr. Hann with the aid of recent observations of temperature in high southern latitudes, especially those made during the Venus transit in 1874. For mean temperature of the whole atmosphere he obtains 15°·4 C., and as that of the northern hemisphere was estimated by Ferrel to be 15°·3 C., it is very probable that both hemispheres have the same mean temperature. Dr. Hann, however, also shows that between 40° and 45° south latitude, the southern hemisphere becomes warmer than the northern in the same latitude, and that a difference between the two persists at least to the confines of the hypothetical antarctic continent. . . ."

In "On some Properties of the Earth," 1880 (Wertheimer and Lea, publ.) occur the following passages, founded on and connected by theory alone (p. 95):—"We thus find the average temperature of the atmosphere at the surface of the earth to be 20° C., the isotherms of 20° C. having in their mean the parallels of 30° for basis; this figure, obtained by reasoning, is confirmed by isothermal maps. We will see *why the* 20° *are lowered to* 15°·22 *C., the true mean temperature of the atmosphere at the surface of the earth.*"

And on pp. 123 to 126: "The line of greatest heat is in the mean moved $\frac{1}{29\cdot78}+\frac{1}{175}$ of the sphere, or 3° 58′+4′ latitude, north of the equator. Temperature is therefore in a compressed or higher state in the lower latitudes of the north." . . .

"Inside the isotherms with the parallels 38° 58′ as basis, the temperature of the north is in excess over that of the south. This isotherm of the mean atmospheric temperature reaches over sea so far north as to embrace those seas which may be called the Mediterranean . . . it reaches on land to 47° 50′–3° 56′, where the temperature of Genoa in 43° 51′ N. lat. is 15°·7 C., and that of Alais 44° 10′ N. lat. is 15°·4 C. Beyond this isotherm, or beyond the bases of 38° 58′ lat., the difference between north and south decreases [which implies that the temperature at the south gets gradually warmer than at the north, chiefly in longitudes examined by Dr. Hann]. . . . At the isotherms of 1°·666 C., of which that at the south is quite maritime, and almost without curving, the equilibrium of temperature between south and north is re-established, the isotherms coincide, each in its mean, in both hemispheres, with their parallels or bases, they divide the hemispheres in proportion 1 : 4·78 . . ."

O. REICHENBACH

Sea-shore Alluvion—the "Chesil"

GREATER attention and speculation have been bestowed on this than any other of our marine littoral moles, the Transactions of various societies abounding in papers describing it, and as the westernmost of our south coast beaches, within the limits of the narrow seas, may well terminate a review thereof.

Leland, Camden, Lambarde, and Holinshed, all describe it, and how it fluctuates in quantity dependent on the wind. Leland used the word "Chesil" (which became a proper name as applied to this particular bank) as a general term, descriptive of shingle banks, throughout his work. Lilly, who wrote in 1715, describes it most accurately. Hutchins calls it "Steepstone," and derives its name from "Ceorl," the Saxon for gravel. Gough adopts the same derivation, calling it "a prodigious heap of pebbles thrown up by the sea, beginning at Chesilton, in Portland, and reaching beyond Swyre, 16¾ miles."

The most remarkable feature is the top "full" about fifteen feet above the lower ones at the Portland end forming a huge seaward wall or mole, exceeding anything of the kind to be seen along our coasts, the land-slope of which is flat. At the east end it is thirty to forty feet above high water of springs, gradually lowering westward, and the stones decreasing in size. The land-locked tidal lake, the "Fleet," between it and the main, is another feature so common to these formations; it terminates opposite the valley to Abbotsbury, down which runs a small mill-stream. Between Lord Ilchester's castle and the Abbotsbury Coastguard Station the great beach ceases, the bight terminating in low tertiary cliffs, which intercept the top "full," the lower "fulls" continuing of an average height, as at Deal and elsewhere; two to three miles west of Abbotsbury the beach is thrown up into very sharp slopes, which, from the fineness of the material, become very solid, and continues to decrease in size and altitude, intercepted by the cliffs at Burton, and again formed into a moderate "full" on each side of Bridport harbour. The great elevation attained by the eastern end of this bank, where it abuts against the Island of Portland, exhibits an exceptional accumulation of water-driven material in the hollow of, and to the north-east of the Great West Bay,